

**Name of initiative:****Interagency Modeling and Analysis Group (IMAG) Multi-scale Modeling (MSM) Initiative****Brief description of goals of initiative:**

IMAG is an interagency working group of representatives from 15 NIH components, four NSF directorates, two Department of Energy (DOE) components, three Department of Defense (DOD) components, the National Aeronautics and Space Administration (NASA), the United States Department of Agriculture (USDA), and the United States Department of Veterans Administration (USDVA). IMAG convenes monthly since April of 2003 to discuss shared interests in applying mathematical modeling and analysis methods to biomedical, biological and behavioral systems. The MSM initiative, sponsored by IMAG, has two main goals 1) the development of new methodologies that span across biological scales that are applicable to biomedical, biological and behavioral research, and 2) multi-scale modeling through model sharing in a collaborative environment. Modeling and analysis methods provide a fundamental infrastructure for understanding and predicting biological processes, diseases, environmental exposures and human behavior patterns in a measurable and quantifiable manner. This initiative addresses the critical challenge of modeling between scales, or multiscale modeling, in which information is integrated across multiple spatial and temporal scales and disease states, moving towards real-time prediction, diagnosis and treatment of human health.

**Principal investigators:** 24 Awards were made from this initiative. The names and contact information of the PIs are listed at:

<http://www.nibib.nih.gov/Research/MultiScaleModeling/ListName>

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**Website address of initiative:**

<http://www.nibib.nih.gov/Research/MultiScaleModeling>

**Brief description of biomedical informatics and computational biology components and their goals:**

The projects funded by the MSM initiative covers a range of scientific research areas, diseases, scales examined, software development, modeling methods and computational tools. Descriptions of these components for each project are found at the project pages under the names of the PIs:

<http://www.nibib.nih.gov/Research/MultiScaleModeling/ListName>

IMAG held the first annual Multiscale Modeling (MSM) Consortium meeting on February 6, 2006 to bring together the grantees to discuss the formation of a model sharing platform for multiscale modeling, and discuss methods to link across multiple scales. From the meeting the following seven working groups were formed:

- 1) Filament Dynamics and Simulation (FDS)

- 2) Cardiac and Skeletal Muscle Physiology
- 3) Cardiovascular and Pulmonary – Hemodynamics and Fluid Dynamics
- 4) Cell Level Modeling
- 5) High Performance Computing, Computational Issues and Algorithms
- 6) Tissue Mechanics
- 7) Multiscale Imaging

These working groups are determining modeling and computational priorities and challenges within the particular working group theme, exploring solutions for model sharing, and starting cross-collaborations within the groups.

**Brief description of resources and tools available for sharing:**

Computational and statistical methods and relationships for spanning multiple scales,

Mathematical and computational models at intermediate levels or scales of organization above and below the currently established single-scale models

Models applicable to biological processes, diseases, environmental exposures and human behavior patterns that can be tangibly demonstrated to be of practical utility to the community at large for research or educational purposes,

A Consortium of Investigators for the purposes of information exchange, encouraging model interoperability, model demonstration and evaluation, and discussion of critical issues pertaining to multi-scale modeling, and

A platform for open source software sharing

**Brief description of integrative efforts:**

The MSM Consortium has identified the need for the adoption of data standards for models and model validation and the adoption of standard ontologies/terminologies for model integration. The working groups are currently exploring the use common software for collaboration purposes. The consortium is willing to contribute to open inventories of resources and tools, and promote interactions with other initiatives

**Opportunities for collaboration or synergy with the NCBCs:**

The NCBCs cover many areas that are relevant to the MSM Consortium. Of high relevance are the multi-scale modeling and modeling focused centers. The centers focusing on areas of image analysis and processing, ontologies and data integration are also of relevance.

Prepared by G. Peng 06/29/2006